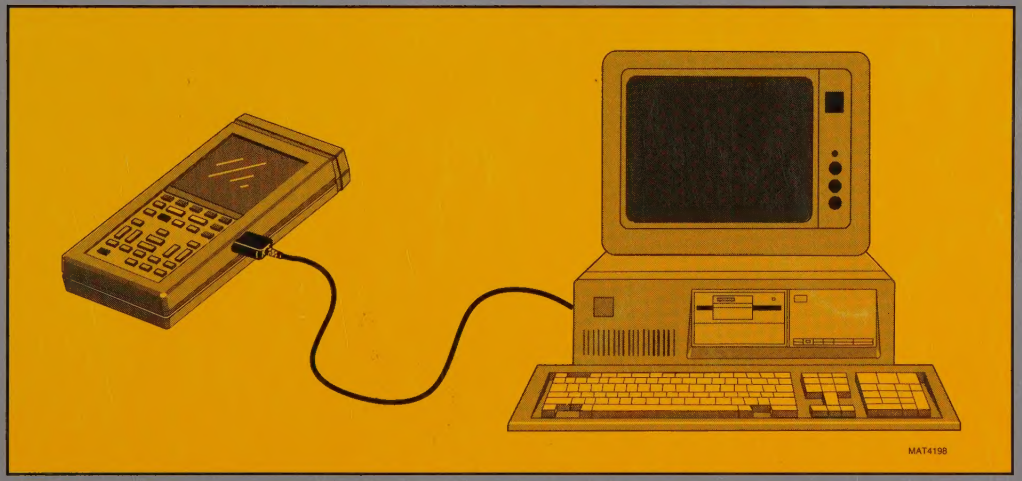
PM9080/001

Optically Isolated RS-232-C Interface Adapter for ScopeMeter Model 97

USERS MANUAL



FLUKE AND PHILIPS - TEST & MEASUREMENT

PHILIPS

FLUKE AND PHILIPS - THE GLOBAL ALLIANCE IN TEST & MEASUREMENT

PM9080/001

Optically Isolated RS-232-C Interface Adapter for ScopeMeter Model 97

USERS MANUAL

4822 872 03386
911110

PHILIPS

© Philips Export B.V. 1991
All rights reserved. No part of this publication may be reproduced by any means or in any form without written permission of the copyright owner.

Table of Contents Page

1. INTRODUCTION 1-1

2. INSTALLATION INSTRUCTIONS 2-1
   2.1 Installation 2-1
   2.2 Communication parameters introduction 2-1

3. CHARACTERISTICS 3-1

4. PROGRAMMING INFORMATION 4-1
   4.1 Introduction 4-1
   4.2 Example Program Frame 4-2
   4.3 Commands in functional order 4-3
   4.4 Commands in alphabetical order 4-3
   4.5 Command Reference 4-4

5. HARDCOPY INFORMATION 5-1

Appendix A ACKNOWLEDGE A-1

Appendix B STATUS B-1

Appendix C WAVEFORM C-1

Appendix D ASCII Codes D-1

6. SALES AND SERVICE ALL OVER THE WORLD ... 6-1

1 INTRODUCTION

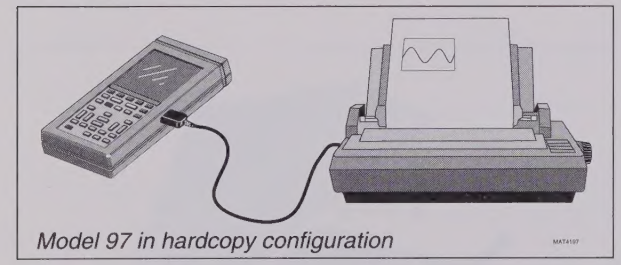
The PM9080/001 is an Optically Isolated RS-232-C Interface Adapter to obtain computer communication facilities with the ScopeMeter Model 97.

It offers two applications:

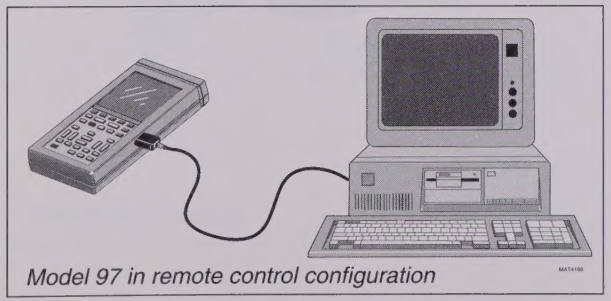
1. Hard copy on Epson FX or HP ThinkJet or compatibles.
2. Remote control and programming of the Model 97 ScopeMeter.

The communication port of the ScopeMeter is optically linked by means of an infrared transmitter (TxD line) and a photo-transistor (RxD line). Because the TxD and RxD lines are the only two implemented lines in the ScopeMeter, handshaking is possible only when using the software Xon/Xoff protocol.

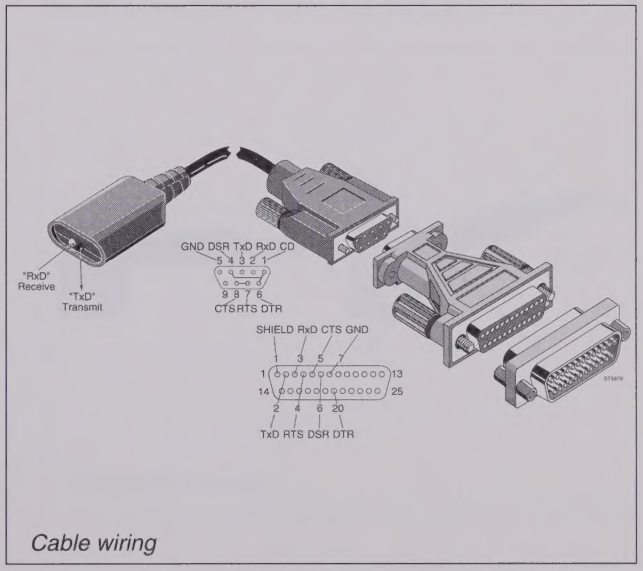
The power neccessary for receiver is generated internally from the voltages on the RTS and/or DTR line.



Model 97 in hardcopy configuration



Model 97 in remote control configuration

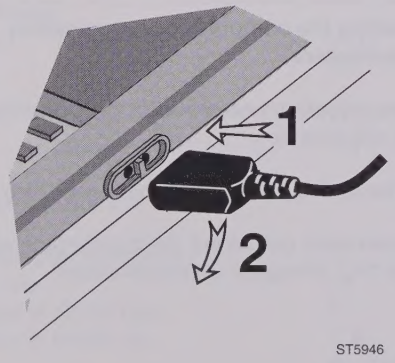


Cable wiring

2 INSTALLATION INSTRUCTIONS

2.1 Installation

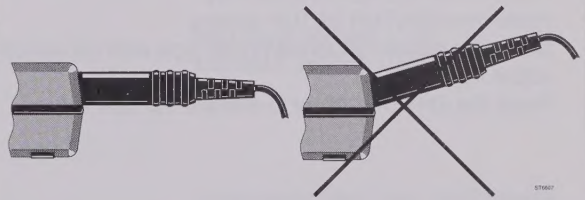
- Connect the cable to the RS-232-C port of the computer or printer; if necessary use the 9-pin to 25 pin adapter or gender changer which are included in the shipment.
- Hook the Optically Isolated RS-232-C Adapter input interface to the ScopeMeter on the right-hand side of the instrument



PM9080/001 hookup

2.2 Communication parameters introduction

For the communication interface there are two sets of parameters that can be set separately.
One parameter set is used when the user invokes a print-out on the ScopeMeter. This set can be changed via the front panel (see Section 2.2.1).
The other parameter set is used in computer communication, and can be set via the Optically Isolated RS-232-C Interface Adapter (see Section 2.2.2)



PM9080/001 hookup

2.2.1 Setting the printer parameters

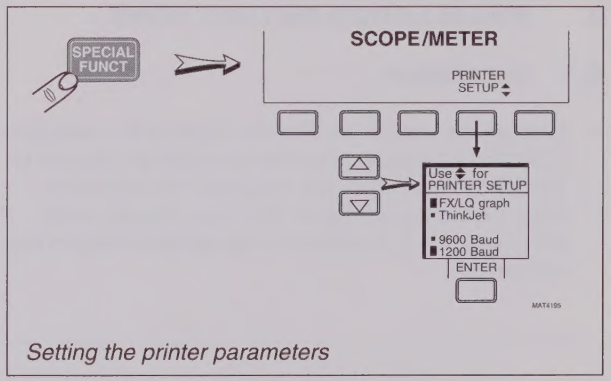
Initially the **printer setup** of the ScopeMeter is:

FX/LQ graph
1200 baud, NO parity, 8 data bits and 1 stop bit.

However the baud rate and the printer type can be changed.This can be done manually via the printer setup menu of the ScopeMeter.
The printer setup is stored in battery-backup-RAM, and after power-on the latest setup is automatically activated.

To change the baud rate or printer type, proceed as follows:

- Switch-on the ScopeMeter.
- Press the SPECIAL FUNCtion key.
- Press the PRINTER SETUP softkey
- Select the desired baudrate/printer type with the select/-adjust keys.
- Press the ENTER softkey to activate the new value



Setting the printer parameters

2.2.2 Setting the computer communication parameters

The **communication parameter** of the ScopeMeter after power-on are always:

1200 baud, NO parity, 8 data bits and 1 stop bit.

These parameters can be set via the interface with the command "PC" (Program Communication).

3 CHARACTERISTICS

Properties expressed in numerical values are guaranteed by the manufacturer within the tolerances stated. Numerical values without tolerances are typical and represent the characteristics of an average instrument. The accuracy of all measurements are valid from 18 °C to 28 °C. Add 0.1 x (Specified accuracy) /°C for < 18 °C or > 28 °C Ambient.

CHARACTERISTICS			SPECIFICATION	ADDITIONAL INFORMATION
* Type of interface			RS-232-C	optical
* States				
SPACE	="0"		light	Wavelength typ. 800 nm.
MARK	="1"		no light	
* Signal levels				
For RxD	Space	”0”	+10V .. +4V	Max input Voltage +15V
	Mark	“1”	-4V .. -10V	Min input Voltage -15V
For rest	Space	”0”	+12V .. +7V	Max input Voltage +15V
	Mark	“1”	-7V .. -12V	Min input Voltage -15V
* Interface functions				
computer communication				
- baud rate			75 … 19200	input/output baud rate are the same
- number of STOP bits			1	
- number of DATA bits			7, 8	parity must be set when data bits = 7
- parity			No, Odd, Even	
- transmission mode			Asynchronous full duplex	
- handshake			Xon/Xoff, None	software handshake enabled/disabled

CHARACTERISTICS	SPECIFICATION	ADDITIONAL INFORMATION
printer output		
- baud rate	1200, 9600	input/output baud rate are the same
- number of STOP bits	1	
- number of DATA bits	8	
- parity	No	
- transmission mode	asynchronous full duplex	
- handshake	Xon/Xoff	software handshake only
* Print facilities		
Protocols	Epson FX/LQ compatible, Hewlett Packard Thinkjet compatible	
Print out	1. screen 2. log readings: - single - every 2, 5, 10 or 60 s 3. waveform data	channel/register selectable
* Control modes	local	control via front panel and RS232
	remote (unlocked)	control via RS-232-C only; return to local "by AUTOSET key" is enabled
	remote/local lockout	control via RS-232-C only; return to local "by AUTOSET key" is disabled
* Connector	9-pin D-type female connector	

CHARACTERISTICS	SPECIFICATION	ADDITIONAL INFORMATION
ENVIRONMENTAL		
* Meets environmental reguirements of	MIL-T-28800D Type III Class 3	
* Temperature		
- operating	0 °C ... 50 °C	
- non operating (storage)	-20 °C ... 70 °C	
MECHANICAL		
* Cable length	1.5 m	
* Weight	0.14 kg	

4 PROGRAMMING INFORMATION

4.1 Introduction

The ScopeMeter can be controlled via the Optically Isolated RS-232-C Interface Adapter using a Compact Programming Language protocol. In this protocol a few, but very powerful, commands are defined.

The main characteristic of the protocol: it is kept simple and straightforward and is fully tailored to use communication facilities like those of GW-Basic.

Commands

All commands consist of two alpha-character headers, some of the headers followed by a **program data separator <pds>** and parameters, which are necessary to give the ScopeMeter more information. The parameters are separated by one or more **program data separators <pds>**.
A **program message terminator <pmt>** appears at the end of a complete command.
The ScopeMeter will execute the command and send an **<acknowledge>** and a cr to signal the end of processing.

There are several 'implicit query' commands, which means that the ScopeMeter will send data back (response) to the computer after receiving and executing the command.

Acknowledge

The **<acknowledge>** reply is meant as a synchronization answer from the ScopeMeter to let the computer know that the received command was executed and let it know how the command was completed.
<acknowledge> is followed by a response message terminator (always a cr). Refer to appendix A for more information about the **<ackowledge>** reply.

Responses

The format of the response data depends on the command which invoked the response.
When several values or strings are returned they are separated by a **response data separator <rds> =** "," (comma).
To signal the end of the response, a **response message terminator <rmt>** = cr (carriage return) is sent.

Data Separators

Data separators are used between parameters sent to the ScopeMeter or between values and strings received from the ScopeMeter.
Separators are fixed. For the data separators it is a comma, for the program data separators there are more options.

PROGRAM DATA SEPARATOR		*RESPONSE DATA SEPARATOR*	
sp	space (ASCII 32)	,	comma (ASCII 44)
ht	horizontal tab (ASCII 9)		
,	comma (ASCII 44)		

Message Terminators:

For both programming and response messages the terminator is defined as:

PROGRAM MESSAGE TERMINATOR	*RESPONSE MESSAGE TERMINATOR*
cr carriage return (ASCII13)	cr carriage return (ASCII13)

4.2 Example Program Frame

A short programming example is given in the Command Reference section for every command.
All examples are written in GW-Basic and run on a PC with the ScopeMeter connected to the COM1 port (RS-232-C).

The example must be embedded in the following program frame.

```
10 OPEN "COM1:1200,N,8,1,CS,DS" AS #1
   :'open serial port

        .. Example here

 980 CLOSE # 1
 990 END
1000 '- handle error
1001 IF (ACK<1) OR (ACK>4) GOTO 1050
1005 ON ACK GOTO 1010,1020,1030,1040
     :'input sync reply
1010 PRINT "SYNTAX ERROR" : GOTO 1090
1020 PRINT "EXECUTION ERROR" : GOTO 1090
1030 PRINT "SYNCHRONIZATION ERROR" : GOTO 1090
1040 PRINT "COMMUNICATION ERROR" : GOTO 1090
1050 PRINT "UNKNOWN ACKNOWLEDGE"
1090 RETURN
```

Initially the serial port of the PC is opened (line 10) with the default settings of the ScopeMeter computer communication parameters.

Then the example lines can be executed.

Also given above is the subroutine that can be called to handle a non-zero <acknowledge> returned from the ScopeMeter.

4.3 Commands in functional order

GROUP	NAME	COMMAND	PAGE
Communication	Program Communication	PC	15
Measurement	Query Measurement	QM	18
Setup	Auto Setup	AS	11
	Default Setup	DS	12
	Program Setup	PS	16
	Query Setup	QS	19
	Recall Setup	RS	22
	Save Setup	SS	23
States	Go to Local	GL	12
	Go to Remote	GR	13
	Local Lockout	LL	14
Trigger	Arm Trigger	AT	11
	Trigger Acquisition	TA	24
Waveform	Program Waveform	PW	17
	Query Waveform	QW	20
Miscellaneous	IDentification Query	ID	13
	Reset Instrument	RI	22
	STatus query	ST	23

4.4 Commands in alphabetical order

COMMAND	NAME	PAGE
AS	Auto Setup	11
AT	Arm Trigger	11
DS	Default Setup	12
GL	Go to Local	12
GR	Go to Remote	13
ID	IDentification query	13
LL	Local Lockout	14
PC	Program Communication parameters	15
PS	Program Setup	16
PW	Program Waveform	17
QM	Query for Measurement data	18
QS	Query Setup	19
QW	Query Waveform	20
RI	Reset Instrument	22
RS	Recall Setup (internal)	22
SS	Save Setup (internal)	23
ST	STatus query	23
TA	Trigger Acquisition	24

4.5 Command Reference

This chapter describes all commands available in the ScopeMeter. The commands are listed in Alphabetical order.

Each command description follows the format shown on the right.

Example:

XXXX YY

Purpose:

Explains the command, its parameters, and limitations.

Command:
An exact description of the programming command.
The parameters are separated by one or more Program Data Separators **<pds>**
Commands are terminated by a program message terminator **<pmt>**, a carriage return (cr).

Response:
An exact description of the response coming from the instrument.

A reply is given after the receipt of each command. This reply is called <acknowledge> and it indicates the status of the command execution. For more information see Appendix A. To obtain a more detailed status description, use the ST command to fetch the **status** word.

Example:
A few example lines demonstrate how easy it is to use the commands in GW-Basic.
The example runs on a PC with the ScopeMeter connected to COM1 port (RS-232-C).

The examples are assumed to be embedded in the Program Frame mentioned in Section 4.2.

AUTO SETUP AS

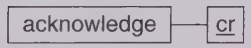
Purpose:

To invoke an AutoSetup.
With this command the ScopeMeter will select the optimum settings for the connected signal(s).

Note: The user can select the items that are affected by the AutoSet procedure via the SETUP softkey menu. (See Users Manual)

Command:

Response:



Note: <acknowledge> comes after the Auto Setup has been completed.

Example:

```
100 PRINT #1,"AS"           :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

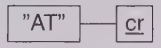
ARM TRIGGER AT

Purpose:

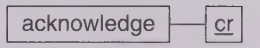
Resets and arms the triggering for a new acquisition trigger.

Note: In Meter Mode, using this command will result in an "execution error"

Command:



Response:



Example:

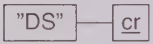
```
100 PRINT #1,"AT"           :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

DEFAULT SETUP DS

Purpose:

To set the instrument in the default setup.
This setup is the same as the setup achieved at Master Reset (see User Manual). The communication interface parameters will not be changed.

Command:



Response:

Note: Wait 1 second after the <acknowledge> reply has been received.

Example:

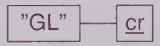
```
100 PRINT #1,"DS"           :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

GO to LOCAL GL

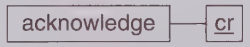
Purpose:

Puts the instrument in the **local** state.
This enables front panel control of the instrument.
This command is one way to go from the **remote** state to the **local** state.
The other possibility is to press the AUTOSET key on the front panel of the ScopeMeter while the instrument is in **remote**, provided that the ScopeMeter is not in the **local lockout** state.
(See also "Go to remote" and "Local Lockout")

Command:



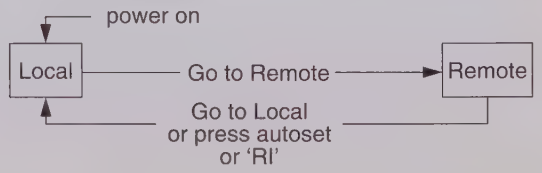
Response:



Example:

```
100 PRINT #1,"GL"           :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

Local - Remote states

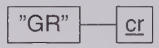


GO to REMOTE GR

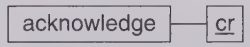
Purpose:

Puts the instrument in the **remote** state.
This means that controlling via the front panel is no longer possible. It is possible to go from the **remote** to the **local** state by sending the Go to Local command or by pressing the AUTOSET key on the front panel when the **local lockout** function is not active.
(See also "Local Lockout" and "Go to Local")

Command:



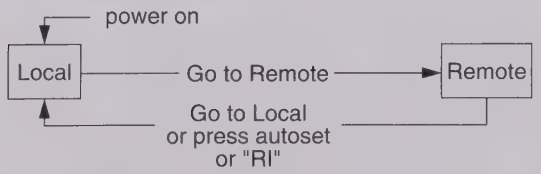
Response:



Example:

```
100 PRINT #1,"GR"           :'Send command
110 INPUT #1, ACK           :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000  :'Handle error
```

Local - Remote states:



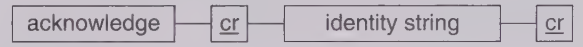
IDENTIFICATION ID

Purpose:

Returns information about the model number of the instrument, and reports the software version.

Command:

Response:



Example:

```
100 PRINT #1,"ID"          :'Send command
110 INPUT #1,ACK           :'Sync on ack.
120 IF ACK <> 0 THEN GOSUB 1000 :GOTO 980 :'Handle
    error
130 INPUT #1,R$            :'Input Identity string
140 PRINT R$
```

example response:

```
ScopeMeter .... etc.
```

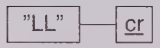
LOCAL LOCKOUT LL

Purpose:

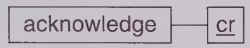
This instruction will inhibit the go to local function of the AUTOSET key on the front panel.

After this command the **local** state has been 'locked away', which means that operating the instrument cannot be put in local via the AUTOSET key.
To put the instrument in **local** after this command has been issued, use the 'Go to Local' or 'Reset Instrument' command (or switch the instrument OFF and ON).
(See also "Go to Remote" and "Go to Local").

Command:



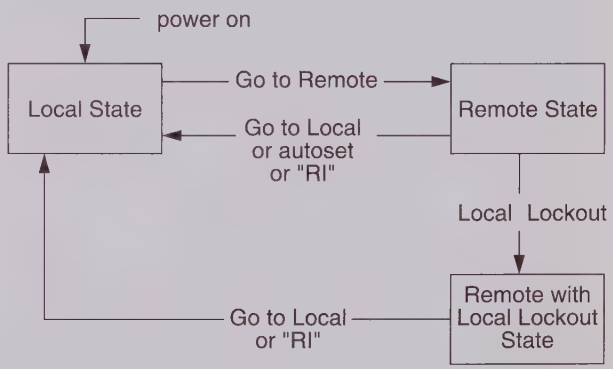
Response:



Example:

```
100 PRINT #1,"LL"           :'Send Command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000  :'Handle error
```

Local Lockout function



PROGRAM COMMUNICATION PC

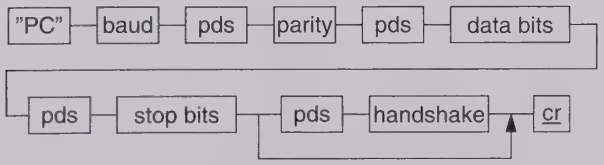
Purpose:

To program baud rate, parity mode, number of data and stop bits, and the handshake method for computer communication.
The string after the command header is identical to the one as used in the GW-Basic OPEN COM statement.

The <acknowledge> reply after the command is sent with the old communication parameters.
When <acknowledge>=0 is received, the new communication parameters become valid immediately.

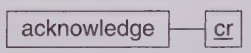
After power on, the setting is always: 1200 baud, NO parity, 8 databits, 1 stopbit and handshake off.
Settings changed with this command are not stored when power is switched off.

Command:



<baud> = 75 . . . 19200
<parity> = O,E or N
<data bits> = 7 or 8
<stopbits> = 1
<handshake> = XONXOFF to enable software handshake
bypass to disable software handshake
<pds> = one or more (sp | ht | ",")
here a comma is preferred for compatibility with GW-Basic

Response:



Example:

```
100 PAR$="1200,N,8,1":'Fill communication-
    parameter string
110 CTL$=",XONXOFF":'Fill handshake method
    string to use XonXoff
120 PRINT #1,"PC";PAR$;CTL$:'Program
    instrument
130 INPUT #1,ACK:'Sync on acknowledge
140 IF ACK <> 0 THEN GOSUB 1000 :GOTO 980
    :'Handle error
    150 CLOSE #1:'ScopeMeter is in new mode,
    close COM port
160 OPEN "COM1:"+PAR$ AS #1:'Reprogram COM
    port.
```

PROGRAM SETUP PS

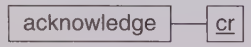
Purpose:

To set the instrument using one compact setup string.
This PS command and the QS (Query Setup) command can be used together to retrieve and restore complete setup of the instrument under computer control.
The format of the programming string must be the same as the format of the received setup string. (see "Query Setup")

Command:

<count> number of strings to follow, always "1" in the ScopeMeter.
<setup> string(s) of hexadecimal characters (0 ... F), representing the acquisition setup of the instrument.

Response:



Note: The <acknowledge> reply is sent after the setup has been completed.

Example:

```
100 PRINT #1,"PS";1;",";    :'Send command
110 PRINT #1,SETUP$         :'Send string *)
120 INPUT #1,ACK            :'Sync on acknowledge
130 IF ACK <> 0 THEN GOSUB 1000  :'Handle error
```

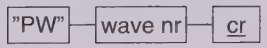
*) This is the string that is received after a "Query Setup" command.

PROGRAM WAVEFORM PW

Purpose:

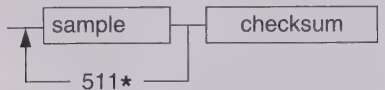
To program the 512 data points of one complete waveform.

Command:

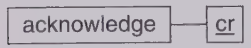


Response 1:

After Response 1 (acknowledge should be 0), the command-string is followed by:



Response 2:



Example:

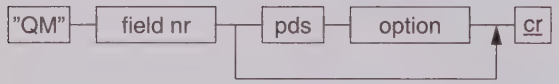
```
100 DIM WAVE%(512)
110 SC%=0
120 PRINT #1,"PW";107:'Program wave form #7
130 INPUT #1,ACK :'Sync on acknowledge
140 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
150 FOR I = 1 TO 512
160 SC%= (SC%+WAVE%(I)) and 255 :'Calculate
    checksum
170 PRINT #1,CHR$(WAVE%(I)); :'Program
    samples
180 NEXT I
190 PRINT #1,CHR$(SC% AND 255);:'Send
    Checksum
200 INPUT #1,ACK :'Sync on acknowledge
210 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

QUERY MEASUREMENT QM

Purpose:

To obtain a measurement result.
The measurement is indicated by a number. In Scope mode the measurements have a unique number. In Meter mode however, because the field number is display oriented, the actual measurement performed depends on the Meter function selected. In the response of the instrument there is always information about the actual measurement performed.

Command:



<option> "V" Only the numerical value of the result will be returned.

<field nr> Scope mode:

nr.	type	meaning
1	dV	voltage between cursors
2	dt	time between cursors
3	1/dt	reciproke of 2
4	TRIG TO -1-	trigger to cursor 1
5	RMS	RMS value measured
6	MEAN	MEAN value measured
7	P-P	peak-peak voltage
8	MAX-P	maximum peak
9	MIN-P	minimum peak
10	FREQ	signal frequency
11	RISE	rise time (10%-90%)
12	PHASE src>des1	with 2 or more signals
13	PHASE src>des2	with 3 or more signals
14	PHASE src>des3	with 4 signals

(where <src> and <des> can be any active trace on display)

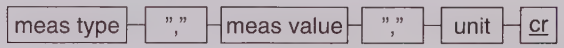
<field nr> Meter mode:

nr.	meaning
1	first measurement result
2	second measurement result
3	first calculated result
4	maximum (record) result
5	average (record) result
6	minimum (record) result

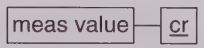
Response:

When acknowledge = 0 (measurement available) this will be followed by:

no option:



with option "V":



<type> : describes the actual measurement
<value> : measurement data
<unit> : measurement unit

These response strings give a detailed description of the measurement result

Examples: (Scope Mode)

Normal query:

```
100 PRINT #1,"QM";5 :'Query RMS
110 INPUT #1,ACK :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000:GOTO 980
    :'Handle error
130 INPUT#1,TYPE$,VALUE,UNIT$:'Read
    result
```

e.g., RMS value of 23.4 mV will be given as:
TYPE$ = "RMS"
VALUE = 02340E-05
UNIT$ = "V"

Values only (option "V"):

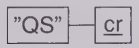
```
100 PRINT #1,"QM";6;",V":'Query MEAN, value
    only
110 INPUT #1,ACK:'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000:GOTO 980
    :'Handle error
130 INPUT #1,VALUE:'Read result
```

QUERY SETUP QS

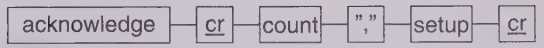
Purpose:

To query the instrument for the current acquisition setup of the instrument.
This command and the Program Setup command can be used together to retrieve and restore a complete setup of the instrument under computer control.
The reply can be stored as a string in the PC for later re-sending using the PS command. (see "Program Setup")

Command:



Response:



<count> number of strings to follow, always "1" in the ScopeMeter.

<setup> a string of hexadecimal characters, representing the acquisition setup data for the instrument.

Example:

```
100 PRINT #1,"QS":'Send command
110 INPUT #1,ACK:'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000:GOTO 980
    :'Handle error
130 INPUT #1,N:'Nr of strings, "1" in
    ScopMeter
140 INPUT #1,SETUP$:'Receive setup
150 PRINT SETUP$
```

response looks like:

```
FF34EFE20020040591.............
```

This SETUP$ string can be stored and returned to the instrument later with the PS command

QUERY WAVEFORM QW

Purpose:

To obtain all data points and the setup parameters of the indicated waveform.
The waveform data received can be sent back using the "PW" command.

Command:

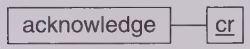
<wave nr> indicates which waveform must be sent to the computer and is a number in the range of 101 ... 111 (see "Recall Setup" and "Save Setup").

101 - ChA	107 - Memory 4
102 - ChB	108 - Memory 5
103 - A ± B	109 - Memory 6
104 - Temp 1	110 - Memory 7
105 - Temp 2	111 - Memory 8
106 - Temp 3	

<option> allows you to change the reponse format:

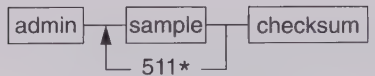
"V" sample values only

Response:

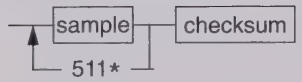


and in case of (acknowledge = 0) followed by:

no option:



with option "V":



<admin>: this is the acquisition description, see Appendix C.

<sample>: binary data represending one sample (values between 0 ... 255).

Note: QW is possible in 8 databits mode only.

Example:

```
100 DIM WAVE% (512)
110 PRINT #1,"QW";103 :'Query for wave form
    #3
120 INPUT #1, ACK :'Sync on acknowledge
130 IF ACK <> 0 THEN GOSUB 1000:GOTO 980
    :'Handle error
140 INPUT #1,NAM$ :'get wave form name
141 INPUT #1, YUM$:'input y-unit
142 INPUT #1, XUM$:'input x-unit
150 FOR I=1 TO 4
160 INPUT #1,ADM(I) :'Read 4 float values
170 NEXT I :' Y-unit...X-delta
180 INPUT #1,RESOL :'Read Y resolution
190 INPUT #1,N :'Read nr of samples
200 SC%=0
210 FOR I=1 TO N
220 WAVE%(I)=ASC(INPUT$(1,#1)) :'Read all
    samples
230 SC%=(SC%+WAVE%(I)) AND 255 :'Calculate
    checksum
240 NEXT I
250 ISC%=ASC(INPUT$(1,#1)) :'Read instrument
    checksum
260 IF ISC% <> SC% THEN PRINT "CHECKSUM
    ERROR"
```

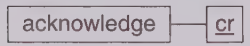
RESET INSTRUMENT RI

Purpose:

Resets the entire instruments firmware, including the CPL protocol handler, and clears all input and output buffers. Interface parameters are **not** changed in order to keep the communication alive. When the reset has been finished the ScopeMeter responds with a "beep".

Command:

Response:



Note: Wait 1 second after the <acknowledge> reply has been received.

Example:

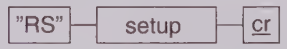
```
100 PRINT #1,"RI"           :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

RECALL SETUP RS

Purpose:

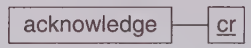
To recall an internally stored setup. This setup must have been stored in the ScopeMeter manually or with the Save Setup command. (see "Save Setup")

Command:



<setup reg> represents the setup
1 . . . 10 : front setup memory
101 . . . 111 : waveform setup memory
see "QW", "PW"

Response:



Note: The <acknowledge> reply will be sent after the internal setup has been completed.

Example:

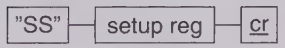
```
100 PRINT #1,"RS";1         :'Send command
110 INPUT #1,ACK            :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

SAVE SETUP SS

Purpose:

To save the current acquisition settings.
This setup can be recalled manually or by sending the Recall Setup command. (see "Recall Setup")

Command:



<setup reg> represents the setup
1 ... 10 : front setup memory
101 ... 111 : waveform setup memory
see "PW", "QW"

Response:

Example:

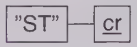
```
100 PRINT #1,"SS";3 :'Save setting in
    register 3
110 INPUT #1,ACK :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

STATUS ST

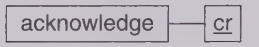
Purpose:

To obtain the instrument status.
Each bit, in the 16-bit binary representation of this value, represents the Boolean value of the related status item. After the reply the value is reset to zero. The complete description of the status word can be found in Appendix B.

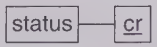
Command:



Response:



when acknowledge=0 followed by:



<status> is a signed integer value, between -32768 ... +32767

Example:

```
100 PRINT #1,"ST" :'Send command
110 INPUT #1,ACK  :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000:GOTO 980
    :'Handle error
130 INPUT #1,STATUS :'Read Status from
    ScopeMeter
```

example status:

6

which means: (because bit 2 and bit 1 are set)
- data out of range
  and
- data format of the body is wrong

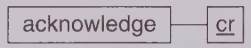
TRIGGER ACQUISITION TA

Purpose:

Acts as a software trigger: the acquisition is started as if a normal signal trigger pulse had come.
In Single Shot the triggering must be armed with the AT-command.
When the ScopeMeter is in Meter Mode, an <acknowledge> = "2", (execution error) will be returned.

Command:

Response:

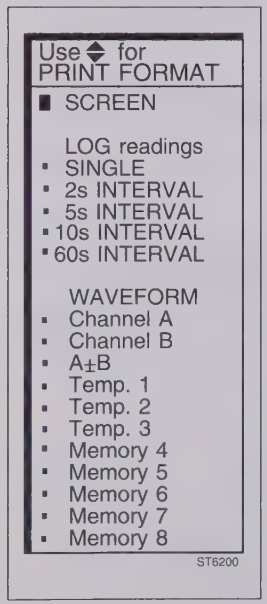


Example:

```
100 PRINT #1,"TA"          :'Send command
110 INPUT #1,ACK           :'Sync on acknowledge
120 IF ACK <> 0 THEN GOSUB 1000 :'Handle error
```

5 HARDCOPY INFORMATION

With the PM9080 serial interface it is possible to print data from the ScopeMeter.
The format of this hardcopy output can be slected from the "SPECIAL FUNCT"-"PRINT FORMAT" menu

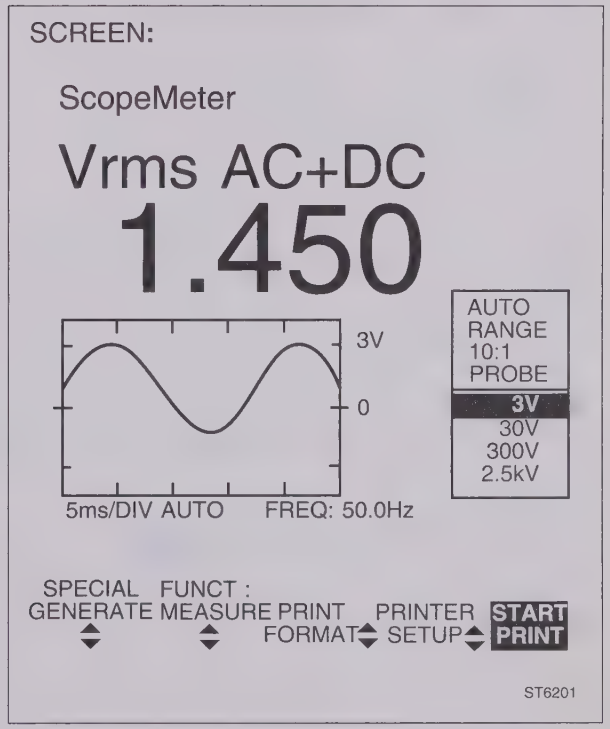


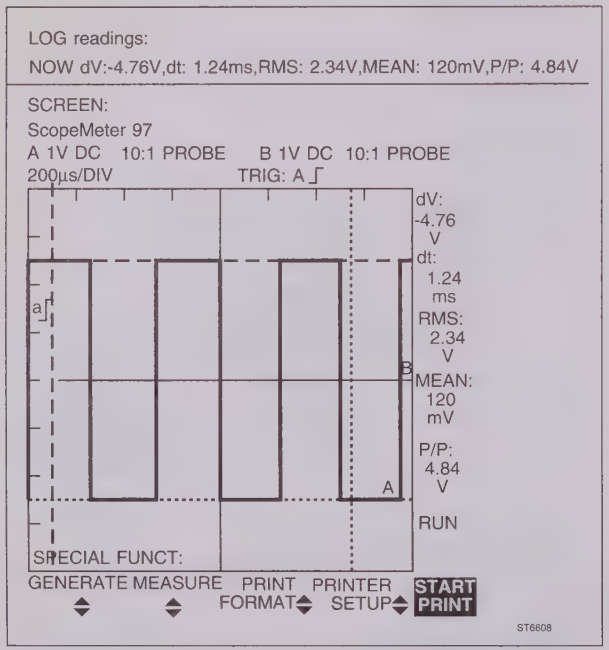
SCREEN:
selects a graphic copy of the actual ScopeMeter screen, in Meter or Scope mode

LOG readings:
selects a numerical printout of the measuring values in table form. In LOG all displayed measurements in Scope mode or Meter mode will be printed. Printing can be done once (SINGLE) or repetitively with a selected interval time.

WAVEFORM:
selects a numerical printout of the data points indicated waveform (only available in Scope mode).

Example printouts:





Actual measurement (NOW), voltage and time between the cursors (dV and dt), the RMS, MEAN and Peak-Peak value of the signal between the cursors.

WAVEFORM printout:

WAVEFORM Channel A 2.00 mV/dot 400 ns/dot
Y-pos 32 dot

22 22 23 23 25 26 24 24 23. . . . . .

*The real voltage of each datapoint can be calculated by subtracting the Y-pos from the datapoint value (22-32= -10) and then multiply this with the 2.00mV/dot parameter (-10 * 20mV = -20mV). The time distance between two dots is 400ns here.*

Appendix A ACKNOWLEDGE

The <acknowledge> reply is a synchronization reply that is returned after each command sent to the ScopeMeter, signalling correct or incorrect operation:

"0" OK, normal situation, no error
"1" Syntax error (ST query may give more info)
"2" Execution error (ST query may give more info)
"3" Synchronization error
"4" Communication error

Explanation and examples of the errors:

Syntax Error:
returned when for some reason the command is not understood by the instrument:

* Unknown header
* Wrong instructions
* Data format of body is wrong, e.g. alpha characters when decimal data needed

Execution Error:
returned when internal processing is not possible:

* Data out of (internal) range
* Conflicting instrument settings

Synchronization Error:
returned when the instrument receives data on the interface while it does not expect anything:

* the instrument receives a new command while a previous command or query is not yet completely finished:
  (<acknowledge> not yet sent out after a command, or response data not yet transmitted).

Communication Error:
any framing, parity or overrun error on the received data will cause a communication error

When an error is detected during the execution of the command, the instrument sends the corresponding <acknowledge> reply, terminates further execution of the command and returnes to the idle state. The instrument will be ready for a new command.

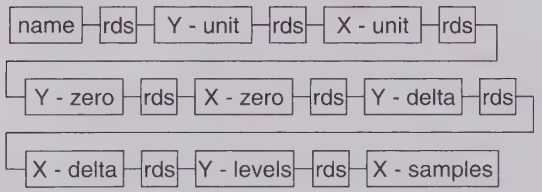
Appendix B STATUS

Bit	Meaning
0	Unknown header
1	Data format of body is wrong e.g, +36A4 when decimal data expected)
2	Data out of range
3	Invalid instruction in current mode
4	Called function not implemented
5	Invalid number of parameters
6	Wrong number of databits
7	Service purposes
8	Service purposes
9	Conflicting instrument settings
10	Reserved for future use "always 0"
11	Service purposes
12	Service purposes
13	Service purposes
14	Checksum error
15	Reserved for future use "always 0"

Appendix C WAVEFORM

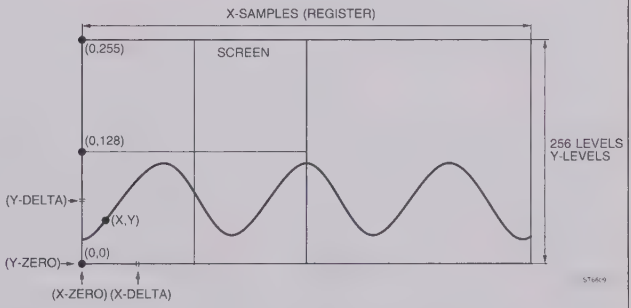
The waveform that is received from the instrument consists of an acquisition description <admin> and an array of samples concluded with a checksumbyte.
The <admin> is in readable format, while the samples and the checksum are in byte format.

<admin>:



<name>	identification string. (max. 40 chars)
<Y-unit>	dimension <unit> of the Y-axis
<X-unit>	dimension <unit> of the X-axis
	<unit> examples:
	s Second
	V Volt
	VV Volt * Volt
	Vs Volt * Second
<Y-zero>	<float prog data> vertical offset value.
<X-zero>	<float prog data> horizontal offset value.
<Y-delta>	<float prog data> value, representing the amplitude difference between 2 subsequent Y-levels
<X-delta>	<float prog data> value, representing the time difference between 2 subsequent X-samples.
<Y-levels>	<dec prog data> giving the number of possible Y-levels
<X-samples>	<dec prog data> giving the number of X-samples

Drawing about the administration in relation to a signal

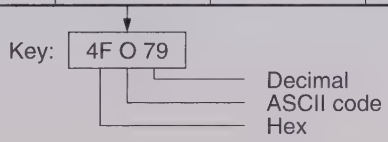


The absolute voltage of the sample (x, y) is given by (y-128 * x delta) - y zero.
The time position of the sample (x, y), relative to the trigger point, is given by: (x * x delta) + x zero.

Appendix D ASCII 7 Bit Codes

ANSI X3.4-1986 ASCII 7 BIT CODE

00 NUL 0	10 DLE 16	20 SP 32	30 0 48	40 @ 64	50 P 80	60 ‘ 96	70 p 112
01 SOH 1	11 XON 17	21 ! 33	31 49	41 A 65	51 Q 81	61 a 97	71 q 113
02 STX 2	12 DC2 18	22 " 34	32 2 50	42 B 66	52 R 82	62 b 98	72 r 114
03 ETX 3	13 XOF 19	23 # 35	33 3 51	43 C 67	53 S 83	63 c 99	73 s 115
04 EOT 4	14 DC4 20	24 $ 36	34 4 52	44 D 68	54 T 84	64 d 100	74 t 116
05 ENQ 5	15 NAK 21	25 % 37	35 5 53	45 E 69	55 U 85	65 e 101	75 u 117
06 ACK 6	16 SYN 22	26 &	36 6 54	46 F 70	56 V 86	66 f 102	76 v 118
07 BEL 7	17 ETB 23	27 ’ 39	37 7 55	47 G 71	57 W 87	67 g 103	77 w 119
08 bs 8	18 CAN 24	28 (40	38 8 56	48 H 72	58 X 88	68 h 104	78 x 120
09 ht 9	19 EM 25	29) 41	39 9 57	49 I 73	59 Y 89	69 i 105	79 y 121
0A lf 10	1A SUB 26	2A * 42	3A : 58	4A J 74	5A Z 90	6A j 106	7A z 122
0B VT 11	1B ESC 27	2B + 43	3B ; 59	4B K 75	5B [91	6B k 107	7B { 123
0C ff 12	1C FS 28	2C , 44	3C < 60	4C L 76	5C \ 92	6C l 108	7C | 124
0D cr 13	1D GS 29	2D - 45	3D = 61	4D M 77	5D] 93	6D m 109	7D } 125
0E SO 14	1E RS 30	2E . 46	3E > 62	4E N 78	5E ^ 94	6E n 110	7E ~ 126
0F SI 15	1F US 31	2F / 47	3F ? 63	4F O 79	5F _ 95	6F o 111	7F DEL 127



Bureau de Liaison Philips
El Mauradia, Alger
Tel: 60 14 05

Angola
LUANDA
Tel: 244-2-372250

Philips Antillana N.V.
Willemstad, Curacao
Tel: 599-9-615277

Philips Argentina S.A.
1430 Buenos Aires
Tel: 54-1-5414106/5417141
Tel: 54-1-5422411/5422451*

Coasin S.A.
Buenos Aires, Argentina
Tel: (54) (1) 552-5248

Philips Scientific &Industrial PTY Ltd.
Auckland 3
New Zealand
Tel: 09-894160

Philips Scientific & Industrial PTY Ltd.
North Ryde
Sydney New South Wales 2113
Tel: 02-888 0416
Tel: 02-888 8222*

Philips Scientific & Industrial PTY Ltd.
Melbourne Victoria 3151
Tel: 03-235 3666

Philips Scientific & Industrial PTY Ltd.
Adelaide South Australia 5008
Tel: 08-3482888

Philips Scientific & Industrial PTY Ltd.
Brisbane Queensland 4101
Tel: 07-8440191

Philips Scientific & Industrial PTY Ltd.
Perth West Australia 6104
Tel: 09-277-4199

Philips Professionelle Elektronik GmbH
A 1102 Wien
Tel: 0222/60101-0

Philips Professionelle Elektronik GmbH
1101 Wien
Tel: 0222-60101 ext. 818

Messrs. Mohamed Fakhroo & Bros
Bahrain
Tel: 973-253529

Philips Bangladesh Ltd.
DHAKA
Tel: 325081-5

Motherland Corporation
Dacca-3, Bangladesh
Tel: 880257249

Manning Wilkinson & Challenor
Bridgetown
Tel: 436-6185

Philips Professional Systems S.A.
1070 Brussel
Tel: 02-525 6692
Tel: 02-525 6694*

Holmes, Williams and Purvey
Hamilton
Tel: 809-2955000

E.P.T.A. INGENIERA S.R.L.
LA PAZ
Tel: 3-25952

Coasin Bolivia S.R.L.
La Paz, Bolivia
Tel: (591) (2) 40962

Philips Medical Systems Ltda.
04661 Sao Paulo S.P.
Tel: 55-11-5234811

ATP Hi-Tek Electronica Ltda.
Sao Paulo, Brazil
Tel: (55) (11) 4215477

Brunei (via Singapore) Philips Project Development (S) PTY Ltd.
Singapore 1231
Tel: 65-3502000

Rank O'Connor's, 5nd Bhd
Bandar Seri Begawan
Negara Brunei Darussalam
Tel: (673) (2) 23109 or 23557

Interconsult (Philips Service)*
1309 SOFIA
Tel: 359-2-200785

Fluke Electronics Canada Inc.
Burnaby, British Columbia
Tel: (604) 439-9004

Fluke Electronics Canada Inc.
Mississauga, Ontario
L4Z 1X9 Canada
Tel: (416) 890-7600

Fluke Electronics Canada Inc.
Ottawa, Ontario
Tel: (613) 723-9453

Fluke Electronica Canada Inc.
Dorval, Quebec
Tel: (514) 685-0022

Fluke Electronics Canada Inc.
Calgary, Alberta
Tel: (403) 291-5215

Philips Chilena S.A. de Product Electr.
Casilla 2678
Santiago de Chile
Tel: 56-2-770038

Itronsa
Santiago, Chile
Tel: (56) (2) 232-4308

Philips HongKong Ltd.
Tel: 7735588

Fluke International Corp.
Beijing 100004
People's Republic of China
Tel: (86) 1 512-3435

Industrias Philips de Columbia S.A.
Apartado Aereo 4282
Bogota
Tel: 57 1-2600600

Sistemas E Instrumentation, Ltda.
Bogota, Colombia
Tel: (57) 232-4532

Electrocom
San Jose
Costa Rica
Tel: 53-0083/57

Branch Office Brno*
61300 BRNO
Tel: 42-2-377426

Obnova Pamatek n.p.*
16041 PRAHA 6
Tel: 42-2-594426/60351

* Sales & Service Centers

D. Ouzounian M. Soultanian & Co. Ltd.
Nicosia
Tel: 357-2-442220

Philips A/S Test &Measurement
DK 2300 Kobenhavn S
Tel: +45-32-882100

Philips Ecuador S.A.
1188Y Cordero
Tel: 593-2-565835

Proteco Coasin Cia., Ltda.
Quito, Ecuador
Tel: (59) 32 529684

Proteco Coasin Cia., Ltda.
Guayaquil, Ecuador
Tel: (593) (4) 387519

Philips Egypt Branch
Middle East B.V.
Dokki, Cairo
Tel: 20-2-3490922

Philips Ethiopia (Priv. Ltd. Co.)
Addis Ababa
Tel: 010-231-1-518300

Awa Southwest Pacific
Suva, Fiji
Tel: (679) 312079

OY Philips AB
SF-02631 Espoo
Tel: +358 0 50261

S.A. Philips Industrielle et Commerciale
93002 Bobigny Cedex
Tel: (1) 49428080
Tel: (1) 49428073*

Philips GmbH - EWI
D-3500 Kassel
Tel: 0561-501466

Philips GmbH - EWI
D 1000 Berlin 30
Tel: 030-21006364

Philips GmbH - EWI
D 4300 Essen 11
Tel: 0201-3610-245

Philips GmbH - EWI
D 6000 Frankfurt 90
Tel: 069-794093-31

Philips GmbH - EWI
D 2000 Hamburg 73
Tel: 040-6797-278
Tel: 040-6797471*

Philips GmbH - EWI
D 8045 Ismaning
Tel: 089-9605-121

Philips GmbH - EWI
D 7012 Fellbach
Tel: 0711-5204-121
Tel: 0711-5204150*

Malawi Engineering Co. Ltd.
ACCRA
Fax: 233-667-131

Philips Scientific Test & Measurement
Watford Herts WD2 4TT
Tel: 0923-240511

Philips Scientific Test & Measurement
Cambridge CB1 2PX
Tel: 0223-358866

Philips S.A. Hellénique
15 GR 17778 Tavros/Athens
Tel: 30-1-4894911

Guyana Stores Ltd.
GEORGETOWN
TLX: 2212 GUYSTORE GY

Philips Hong Kong Ltd.
Hung Hom, Kowloon, HongKong
Tel: 7735588

Schmidt & Co (H.K.), Ltd.
Wanchai, Hong Kong
Tel: (852) (5) 8330-222

MTA-MMSZ Philips Service*
1502 BUDAPEST
Tel: 36-1-1869760

Heimelistaeki S.F.
125 Reykjavik
Tel: 354-1-691500

Sameind H.F.
125 Reykjavik
Tel: 354-1-25833

Peico Electronics & Electricals Ltd. I&E Division
Bombay 400 025
Tel: 022 4930311/4930590

Peico Electronics & Electricals Ltd. I&E Division
Calcutta 700 020
Tel: 473621

Peico Electronics & Electricals Ltd. I&E Division
New Delhi 110 015
Tel: 530153
Tel: 533956/57*

Peico Electronics & Electricals Ltd. I&E Division
Madras 600 006
Tel: 472341

Peico Electronics & Electricals Ltd. I&E Division
Bangalore 560 001
Tel: 579119/579164

Hinditron Services Pvt., Ltd.
Andherl (E) Bombay
400 093, India
Tel: (91) (22) 636-4560
(91) (22) 634-8268

Hinditron Services Pvt., Ltd.
Bangalore 560 080, India
Tel: (91) (812) 363-139

Hinditron Services Pvt., Ltd.
Calcutta 700 017, India
Tel: (91) (33) 432-628

Hinditron Services Pvt., Ltd.
New Delhi, 110 019, India
Tel: (91) (11)-641-0380

Hinditron Services Pvt., Ltd.
Secunderabad 500 003, India
Tel: (91) (842) 821-1117

P.T Daeng Brothers
Jakarta 12950
Tel: 021 5201122

Fluke International Corp.
Everett, WA 98206-9090
Tel: (206) 356-5500

* Sales & Service Centers

Philips Iran Ltd.
Private Joint Stock Comp.
TEHRAN
Tel: 98-21-674138/675158

Al-Tel Co. Ltd.
Baghdad
Tel: 964-1-7191982

Circuit Specialists Ltd.
Castleroy, Limerick
Tel: 061 330333

Philips S.p.A.
20052 Monza
Tel: (039) 3635240/8/9

NF Circuit Design Block Co., Ltd.
Kokokuku, Yokohama 223
Tel: (045) 452-0411

Nihon Philips Corporation*
Minatu-ku Tohyo 108
Tel: 4485511

John Fluke Mfg. Co., Inc.
Minato-ku, Tokyo 105, Japan
Tel: (81) (3) 434-0181

John Fluke Mfg. Co. Inc.
Chuo-ku, Osaka 541
Japan
Tel: (81) (6) 229-0871

Jordan Medical Supplies & Services
Amman Jordan
Tel: 962-6-819929

Philips Kenya Ltd.
Nairobi
Tel: 254-2-557999

Korea, Republic of Myoung Corporation
Seoul, Korea
Tel: (82) (2) 784-9942

IL Myoung, Inc.
Seoul, Korea
Tel: 82 2 552-8582-4

Myoung Corporation
Taegu, Korea
Tel: 82 53 753-8163/4

Yusaf A. Alghanim & Sons
KUWAIT
Tel: 965-4843988

Philips Industries (Korea) Ltd.
Seoul
Tel: 82-2-7970378

Hanmac Electronics Co. Ltd.
Seoul
Tel: 82-2-5537441

Electronic Supplies S.A.R.L.
Beirut
Tel: 01-894243

Philips Luxembourg
L-1818 Howald
Tel: 496111

Electronic Systems (Malaysia)
Sdn. Bhd.
Petaling Jaya - Selangor 46200
Tel: 60-3-7560112

Mecomb Malaysia Sdn. Bhd.
Selangor, Malaysia
Tel: (60) (3) 774-3422

Charles A. Micallef & Co. Ltd.
Valletta
Tel: 356-221168

Mexicana de Electronica Industrial S.A. (Mexel)
C.P. 03100, Mexico
Tel: (90) (5) 680-4323

Mexel Servicios en Computacion*
Mexico D.F.
Tel: 90-5-563-5411

Samtel*
Casablanca
Tel: 243050

Somaciel
Casablanca 05
Tel: 308051/52

Interelectra E.E.
MAPUTO
TLX: 6203 NEGONHO

Bhajuratna Engineering & Sales (P) Ltd.
Kathmandu
Tel: 2-25134

Associated Enterprises
Kathmandu, Nepal
Tel: 13868

Philips Nederland B.V.
Test en Meetapparaten
5000 AC Tilburg
Tel: 013-390112

Philips Nederland
Technische Service Prof. Akt.*
5652 AJ Eindhoven
Tel: 040-723293

Philips Scientific & Industrial PTY Ltd. Test & Measurement Dept.
Auckland 3
Tel: 09-084-160

Associated Electronic Products (Nigeria) Ltd.
Lagos
Tel: 234-1-900160/69

Norsk A/S Philips
0612 Oslo 6
Tel: 47-2-741010
Tel: 47-2-290942

Messrs. Mustafa Jawad Trading Co.
RUWI - MUSKAT
Tel: 968-709955

Philips Electrical Co. of Pakistan (Private) Ltd.
Karachi - 74400
Tel: 92-21-725772-8

Fluke International Corp.
Everett, WA 98206-9090
Tel: (206) 356-5500
TLX: 185103 FLUKE UT
FAX: (206) 356-5116

Philips del Paraguay S.A.
Asuncion
Tel: 595-21-291924/291934

Philips Peruana S.A.
Lima 100
Tel: 51-14-350059

Importaciones y Representaciones Electronicas S.A.
Lima 1, Peru
Tel: (51) (14) 28-8650

Philips Industrial Development Inc.
Makati, Metro Manila
Philippines
Tel: 810-0161

* Sales & Service Centers

Spark Radio & Electronics, Corp.
Philippines
Tel: (63) (2) 775192

Electronic Instrument Service*
60-188 PODZNAN
Tel: 48-61-481998

Philips Portuguesa, S.A.R.L. Division of I & E
1009 Lisboa Codex
Tel: 1-657181

Philips Portuguesa* Division I & E
4100 Porto
Tel: (2) 678278

Darwish Trading Company
Doha, Qatar
Tel: 974-434308

Polytechnic Inst. Bucarest* L.C.M.S. Philips Service
BUCAREST 70100
Tel: 40-0-505935

Messrs. A. Rajab & A. Silsilah
Jeddah 21411
Tel: 966-2-6610006

Messrs. A. Rajab & A. Silsilah
Riyadh 11411
Tel: 966-1-4122425

Messrs. A. Rajab & A. Silsilah
Damman
Tel: 966-3-8322596/8331870

Philips Project Development (S) PTY Ltd.
Singapore 9131
Tel: 65-3502000

Rank O'Connor's Pte Ltd.
Singapore 0511
Tel: (65) 473-7944

South African Philips PTY Ltd.
Johannesburg 2000
Tel: 27-11-889-3911

South African Philips PTY Ltd.*
Martindale, New Ville 2092
Tel: 27-11-470-5937

Philips Iberica SAE
08004 Barcelona
Tel: 34-3-3361061

Philips Iberica*
28027 Madrid
Tel: 34-1-4042200

Philips Iberica SAE*
48012 Bilbao
Tel: 34-4-4313800

Hayleys Electronics & Engineering Ltd.
COLOMBO 10
Tel: 94-1-699087

Computerlink Data Systems, Ltd.
Colombo, 5, Sri Lanka
Tel: (94) (1) 502202/3

C. Kersten & Co. N.V.
P.O. Box 1808
PARIMARIBO

Surtel
PARIMARIBO
Tel: 597-72118/77880

Philips Kistaindustrier AB
16493 Kista
Tel: 46-8-7031370

Philips AG Test und Messtechnik
8027 Zurich
Tel: 01 4882390

Philips SA Test et Mesure
1196 Gland
Tel: 022/647171

Al-Shahed Electronics and Trading Co.
Damascus
Tel: 228003/218605

Philips Taiwan Ltd.
10446 Taipei
Tel: 886-2-5097666

Schmidt Scientific
Taipei
Taiwan
Tel: 02-5005779

Philips (Tanzania) Ltd.
Dar es Salaam
Tel: 2555129571

Philips Electrical Co. of Thailand Ltd.
Bangkok 10500
Tel: 66-2-233-6330/9

Measuretronix Ltd.
Bangkok 10240
Thailand
Tel: (66) (2) 375-2733

Compression & Power Services (1988) Ltd.
SAN FERNANDO By Pass
Tel: 653-5445/6/7

S.T.I.E.T.
32 bis rue Ben Ghedahem
Tunis
Tel: 348666

Turk Philips Ticaret A.S.
80640 Levent-Istanbul
Tel: 90-1-1792770

Al Sanani Trading Est.
Abu Dhabi, U.A.E.
Tel: 971-2-771370

Haris Al-Afaq Ltd.
Dubai, U.A.E.
Tel: 971-4-283625

Industrias Philips del Uruguay S.A.
Montevideo, Uruguay
Tel: (598) (2) 921111

N.V. Philips Gloeilampenfabrieken
MOSCOW
Tel: 7095-2302485

Infomedia Sotrudnichiestvo
121111 MOSCOW
Tel: 240 52 52

Inds. Venezolanas Philips S.A.
Caracas 1010-A
Tel: 58-2-905.7061

Cossin C.A.
Caracas 1070-A, Venezuela
Tel: (58) (2) 241-03-09

Rashed Trading & Travel Agency
Sana'a, Yemen
Tel: 967-2-273231

N.V. Philips Gloeilampenfabrieken
BEOGRAD
Tel: 38-11-625344

Jugoelectro*
11070 BEOGRAD
Tel: 38-11-178134

Technicar Servis*
41000 ZAGREB
Tel: 041-276333

Philips Electronics S.A.R.L.
Kinshasa
Tel: 31693

* Sales & Service Centers

Philips Electrical Zambia Ltd.
Lusaka
Tel: 218511/218701

Philips Electrical (Pvt.) Ltd.
Harare
Tel: 263-4-47211

For Countries not listed above:

Philips Export B.V.I & E Export Test & Measurement
Building HVW-3
PO Box 218
5600 MD Eindhoven
The Netherlands
Tel: +31 40 766546
Fax: +31 40 766612
TLX 35000 phtc nl

Fluke Int'l Corp.
PO Box 9090
Mail Stop 206A
Everett, WA 98206-9090
Tel: 206-356-5500
Fax: (206) 356-5116
TLX: 185103 FLUKE UT

USA

Huntsville
Huntsville, AL 35805-6202
(205) 837-0581

Phoenix
Tempe, AZ 85282
(602) 438-8314

Irvine*
Irvine, CA 92714
(714) 863-9031

Nothern*
Fremont, CA 94538
(415) 651-5112

Denver*
Aurora, CO 80014
(303) 695-1000

Hartford
Glastonbury, CT 06033
(203) 659-3541

Altamonte Springs*
Altamonte Springs, FL 32803
(407) 331-4881

Atlanta
Marietta, GA 30067
(404) 953-4747

Chicago*
Palatine, IL 60067
(708) 705-0500

Indianapolis
Indianapolis, IN 46268
(317) 875-7870

Boston
Billercia, MA 01821
(508) 663-2400

Rockville*
Rockville, MD 20852
(301) 770-1570

Detroit
Plymouth, MI 48170
(313) 522-9140

Minneapolis
Eagan, MN 55121
(612) 854-5526

St. Louis
St. Louis, MO 63146
(314) 993-3805

Paramus*
Paramus, NJ 07652
(201) 262-9550

Rochester
Rochester, NY 14622
(716) 323-1400

Greensboro
Greensboro, NC 27408
(919) 273-1918

Cleveland
Middleburg Heights, OH 44130
(216) 234-4540

Philadelphia
Malvern, PA 19355
(215) 647-9550

Dallas*
Dallas, TX 75229
(214) 869-0311

San Antonio
San Antonio, TX 78216
(512) 340-0498

Seattle*
Bellevue, WA 98005
(206) 881-6966

* Sales & Service Centers

Northern California
Fremont, California
(1) (415) 651-5112

Southern California
Irvine, California
(1) (714) 863-9031

Denver
Aurora, Colorado
(1) (303) 695-1171

Orlando
Altamonte Springs, Florida
(1) (407) 331-2929

Chicago
Palatine, Illinois
(1) (708) 705-0500

Washington D.C.
Rockville, Maryland
(1) (301) 770-1576

Paramus
Paramus, New Jersey
(1) (201) 599-9500

Dallas
Carrollton, Texas
(1) (214) 406-1000

Seattle
Everett, Washington
(1) (206) 356-5560

OTHER COUNTRIES:

Buenos Aires, Argentina
Coasin S.A.
(54) (1) 552-5248

La Paz, Bolivia
Coasin Bolivia S.R.L.
(591) (2) 340-962 or 363-365

Sao Paulo, Brazil
ATP/Hi-Tek Electronica Ltda.
(55) (11) 421-5477

Mississauga, Ontario, Canada
Fluke Electronics Canada Inc.
(416) 890-7600

Santiago, Chile
Itronsa
(56) (2) 232-4308

Beijing, People's Republic of China
Fluke International Corp.
(86) (1) 512-3435

Bogota, Colombia
Sistemas E Instrumentation, Ltda.
(57) 287-5424

Quito, Ecuador
Proteco Coasin Cia., Ltda.
(593) (2) 230-283

Wanchai, Hong Kong
Schmidt & Co (H.K.), Ltd.
(852) (5) 833-0222

Tel Aviv, Israel
R.D.T. Electronics Engineering Ltd.
(972) (3) 548-3737

Tokyo, Japan
John Fluke Mfg. Co., Inc.
(81) (3) 3434-0181

Seoul, Korea
IL Myoung, Inc.
(82) (2) 552-8582-4

Selangor, Malaysia
Mecomb Malaysia Sdn. Bhd.
(60) (3) 774-3422

Colonia del Valle, Mexico
Mexicana de Electronica Industrial, S.A. (Mexel)
(52) (5) 682-8040

Lima, Peru
Importaciones y Representaciones Electronicas S.A.
(51) (14) 28-8650

Metro Manila, Philippines
Spark Radio & Electronics, Corp.
(63) (2) 700-621

Singapore, Republic of Singapore
Rank O'Connor's Singapore PTE Ltd.
(65) 473-7944

Taipei, Taiwan, R.O.C.
Schmidt Scientific Taiwan
(886) (2) 501-3468

Bangkok, Thailand
Measuretronix Ltd.
(66) (2) 375-2733-4

Montevideo, Uruguay
Coasin Uruguaya S.A.
(598) (2) 789-015

Caracas, Venezuela
Coasin C.A.
(58) (2) 241-03-09

FOR COUNTRIES NOT LISTED ABOVE:

Fluke International Corp.
PO Box 9090
Mail Stop 206A
Everett, WA 98206-9090
U.S.A.
Tel: (1) (206) 356-5500
Fax: (1) (206) 356-5116
Tlx: 185103 FLUKE UT

* Sales & Service Centers

4822 872 03386
911110